

ERV Vertical Unit Ventilators

Classroom Ventilators with Energy Recovery

Installation, Operation and Maintenance Instructions Manual



Capacity: 800 to 2,000 cfm

**Model: ERV1100w, ERV2000w with WSHP, Electric
or Hydronic Heating**



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Nomenclature

ERV1100w Nomenclature (1,100 cfm nominal)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. FROST CONTROL D – Recirc defrost ¹ E – Exhaust only ² V – VSD frost prevention ³ N – Non-defrost 2. VOLTAGE/SPEED A – 120/1/60 – two-speed ⁴ B – 208/120/1/60 – two-speed ⁵ C – 230/120/1/60 – two-speed ⁵ D – 208/3/60 – two-speed ⁶ E – 230/3/60 – two-speed ⁶ F – 460/3/60 – two-speed ⁶ 3. HEATING E – Electric heat H – Hot water M – High efficiency gas, modulating ^{4/7} T – High efficiency gas, two-stage ^{4/7} P – Proportional electric heat ⁸ R – Hot gas reheat, on/off ^{9/10} S – Hot gas reheat, modulating ^{9/10} X – No heat 4. HEATING CAPACITY A – No heat Electric Options B – 2.5 kW (one-stage) ⁷ C – 5.0 kW (one-stage) ¹¹ D – 5.0 kW (two-stage) ⁷ P – 7.5 kW (one-stage) ¹² E – 7.5 kW (two-stage) ⁷ Q – 10.0 kW (one-stage) ¹² F – 10.0 kW (two-stage) ⁷ R – 12.5 kW (one-stage) ¹² Hot Water Options I – 50–70 MBH Hot Gas Reheat Options M – 30–40 MBH ⁹ Gas Options J – 40 MBH ⁷ K – 60 MBH ⁷ 5. GAS TYPE G – Natural gas L – Propane gas (CAN) P – Propane gas (US) X – Not applicable 6. COOLING C – Chilled water ^{6/13} E – Chilled water with condensate pump ^{6/13} Split System D – Dx coil only ¹⁴ F – Dx coil with condensate pump ¹⁴ Integrated System H – Copper, WSHP ⁶ K – Copper with condensate pump, WSHP ⁶ N – Cupro-nickel, WSHP ⁶ P – Cupro-nickel with condensate pump, WSHP ⁶ V – Condensate pump only, for gas heat X – No Cooling																17. FREE COOLING F – Free cooling ²¹ X – No free cooling 16. VALVES A – Basic valve kit ^{9/19} B – Motorized on/off ^{9/19} C – Motorized on/off, automatic flow rate control ^{9/19} D – On/off zone, automatic flow rate control ^{9/19} E – Automatic flow rate control ^{9/19} F – No valves, flexible hose kit only ⁹ X – Not applicable ²⁰ 15. COOLING CAPACITY A – 2.0 ton B – 2.5 ton C – 3.0 ton D – 3.5 ton ¹⁴ H – 2.5 ton, two-stage ¹⁸ J – 3.0 ton, two-stage ^{7/18} K – 3.5 ton, two-stage ¹⁸ X – Not applicable 14. REFRIGERANT B – R410a X – Not applicable 13. ENERGY RECOVERY 1 – Aluminum wheel, no purge 12. EXTERNAL DISCONNECT N – Non-fused disconnect switch ¹⁷ X – No disconnect switch 11. RETURN AIR DAMPER 1 – Motorized 2 – Spring return 10. EXHAUST AIR DAMPER 1 – Insulated motorized 2 – Insulated spring return 3 – No damper ¹⁶ 9. OUTSIDE AIR DAMPER 1 – Insulated motorized 2 – Insulated spring return 3 – Insulated modulating spring return 4 – No damper ¹⁶ 8. SUPPLY DISCHARGE T – Top plenum, no grille ¹⁵ G – Top plenum, c/w grille ¹⁵ D – Top plenum, c/w double deflection grille S – Silencer plenum, c/w grille ¹⁵ X – No top plenum 7. CONTROLS D – Stand alone DDC controls R – Stand alone DDC controls with remote occupant interface X – No controls - field provided low voltage sequencing required

Notes:

- When ordering recirc defrost, you must order an exhaust air damper.
- An outside air damper must be selected.
- Not available with two-stage compressors.
- Not available with WSHP (water source heat pump) or electric heat options.
- Requires a neutral wire with L1 and L2.
- Not available with gas heating options.
- Not available with three-phase voltage.
- First stage is proportional and second stage (if applied) is fixed.
- Only available with WSHP (water source heat pump) options.
- Not available with controls option 'D – Stand alone DDC controls'.
- Not available with 460/3/60.
- Not available with single-phase voltage: 208/120/1 and 230/120/1.

- Chilled water coil available with 3.0 ton capacities only.
- Dx 'A' coils available with 2.0, 2.5 and 3.0 ton – 13 SEER. Not available for 3.5 ton option.
- Not available with gas and does not allow top access for electrical or pipe routing.
- Non-defrost only.
- Non-fused disconnect switch is field installed (remote mounted).
- Available with R410a WSHP (water source heat pump).
- Option includes: ball valve, blowdown valve, strainer and p/t port.
- Not available with WSHP (water source heat pump).
- Supply and exhaust airflows will be unbalanced. Free cooling is not available with gas heating or hot gas reheat.

ERV2000w Nomenclature (2,000 cfm nominal)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. FROST CONTROL D – Recirc defrost ¹ E – Exhaust only ² V – VSD frost prevention ³ N – Non-defrost	2. VOLTAGE/SPEED A – 120/1/60 – two-speed ⁴ B – 208/120/1/60 – two-speed ⁵ C – 230/120/1/30 – two-speed ⁵ D – 208/3/60 – two-speed E – 230/3/60 – two-speed F – 460/3/60 – two-speed	3. HEATING E – Electric heat H – Hot water P – Proportional electric heat ⁶ R – Hot gas reheat, on/off ^{7/8} S – Hot gas reheat, modulating ^{7/8} X – No heat	4. HEATING CAPACITY A – No heat Electric Options B – 2.5 kW (one-stage) ⁹ C – 5.0 kW (one-stage) ¹⁰ D – 5.0 kW (two-stage) ⁹ P – 7.5 kW (one-stage) ¹¹ E – 7.5 kW (two-stage) ⁹ Q – 10.0 kW (one-stage) ¹¹ F – 10.0 kW (two-stage) ⁹ R – 12.5 kW (one-stage) ¹¹ Hot Water Options I – 60–90 MBH Hot Gas Reheat Options M – 40–50 MBH ⁷	5. GAS TYPE X – Not applicable	6. COOLING C – Chilled water ¹² E – Chilled water with condensate pump ¹² Split System D – Dx coil only ¹³ F – Dx coil with condensate pump ¹³ Integrated System H – Copper, WSHP K – Copper with condensate pump, WSHP N – Cupro-nickel, WSHP P – Cupro-nickel with condensate pump, WSHP X – No Cooling	7. CONTROLS D – Stand alone DDC controls R – Stand alone DDC controls with remote occupant interface X – No controls - field provided low voltage sequencing required										17. FREE COOLING F – Free cooling ²⁰ X – No free cooling
																16. VALVES A – Basic valve kit ^{7/18} B – Motorized on/off ^{7/18} C – Motorized on/off, automatic flow rate control ^{7/18} D – On/off zone, automatic flow rate control ^{7/18} E – Automatic flow rate control ^{7/18} F – No valves, flexible hose kit only ⁷ X – Not applicable ¹⁹
																15. COOLING CAPACITY C – 3.0 ton D – 3.5 ton ¹³ E – 4.0 ton F – 5.0 ton J – 3.0 ton, two-stage ^{9/17} K – 3.5 ton, two-stage ¹⁷ M – 4.0 ton, two-stage ¹⁷ X – Not applicable
																14. REFRIGERANT B – R410a X – Not applicable
																13. ENERGY RECOVERY 1 – Aluminum wheel, no purge
																12. EXTERNAL DISCONNECT N – Non-fused disconnect switch ¹⁶ X – No disconnect switch
																11. RETURN AIR DAMPER 1 – Motorized 2 – Spring return
																10. EXHAUST AIR DAMPER 1 – Insulated motorized 2 – Insulated spring return 3 – No damper ¹⁵
																9. OUTSIDE AIR DAMPER 1 – Insulated motorized 2 – Insulated spring return 3 – Insulated modulating spring return 4 – No damper ¹⁵
																8. SUPPLY DISCHARGE T – Top plenum, no grille ¹⁴ G – Top plenum, c/w grille ¹⁴ D – Top plenum, c/w double deflection grille S – Silencer plenum, c/w grille ¹⁴ X – No top plenum

Notes:

- When ordering recirc defrost, you must order an exhaust air damper.
- An outside air damper must be selected.
- Not available with two-stage compressors.
- Not available with WSHP (water source heat pump) or electric heat options.
- Requires a neutral wire L1 and L2.
- First stage is proportional and second stage (if applied) is fixed.
- Only available with WSHP (water source heat pump) options.
- Not available with controls option 'D – Stand alone DDC controls'.
- Not available with three-phase voltage.
- Not available with 460/3/60.
- Not available with single-phase voltage: 208/120/1 and 230/120/1.
- Chilled water coil available with 3.0 and 5.0 ton capacities.
- Dx 'A' coils available with 3.0 and 4.0 ton – 13 SEER. Not available for 3.5 ton option. Contact factory for information on 5.0 ton – 13 SEER coil.
- Not available with gas and does not allow top access for electrical or pipe routing.
- Non-defrost only.
- Non-fused disconnect switch is field installed (remote mounted).
- Available with R410a WSHP (water source heat pump) only.
- Option includes: ball valve, blowdown valve, strainer and p/t port.
- Not available with WSHP (water source heat pump).
- Supply and exhaust airflows will be unbalanced. Free cooling not available with hot gas reheat.

Safety Considerations

Warning, Caution and Important notes appear throughout this manual in specific and appropriate locations to alert Installing Contractors and maintenance or service personnel of potential safety hazards, possible equipment damage or to alert personnel of special procedures or instructions that must be followed as outlined below.

⚠ WARNING

Identifies an instruction which, if not followed, might cause serious personal injuries including possibility of death.

CAUTION

Identifies an instruction which, if not followed, might severely damage the unit, its components, the assembly or final installation.

IMPORTANT

Indicates supplementary information needed to fully complete an instruction or installation.

Hazards may exist within this equipment because it contains electrical and powerful moving components. Only qualified service personnel should install or service this equipment. Untrained personnel can perform basic maintenance such as maintaining filters. Observe precautions marked in literature and on labels attached to unit. Follow all safety codes.

⚠ WARNING

Disconnect the main power switch to the unit before performing service or maintenance procedures. Electric shock can cause personal injury.

Specifications

The Vertical Unit Ventilator (VUV) series is one of the successful solutions to ventilation and indoor air quality problems from Venmar CES. This series consists of commercial heat and energy recovery ventilators with heating and/or cooling. Designed as appliances, they are ideally suited as complete classroom ventilators. With an upright configuration and small footprint, they require a minimum amount of space for installation. An optional top supply plenum allows for flexibility to suit various installations. The cabinet is well insulated and tightly sealed to provide quiet operation.

Case

- 0.04" [1 mm] pre-finished steel
- Heavy gauge pre-finished steel
- Smooth texture
- Bone white finish
- Heavy gauge internal framework

Unit Dimensions

- See [Appendix A](#) for ERV1100w and ERV2000w.

Plenum Dimension Drawings

- See [Appendix B](#) for ERV1100w and ERV2000w.

Airflow Performance Data

- See [Appendix C](#) for ERV1100w and ERV2000w.

Energy Recovery Module

- Aluminum enthalpy wheel

Filtration – Supply, Exhaust and Return Air

- ERV1100w: 2" [51 mm] MEF disposable filter 12" x 24" [305 x 610 mm] standard outdoor air and 16" x 16" x 2" [406 x 406 x 51 mm]

- ERV2000w: 2" [51 mm] MEF disposable filter 12" x 24" [305 x 610 mm] standard outdoor air and 20" x 20" x 2" [508 x 508 x 51 mm]

Electric Heat Option

- Open coil electric resistance elements
- Two-stage operation:
 - Stage one
2.5 to 5.0 kW – 208–230V, one-phase, 60 Hz
5.0 to 12.5 kW – 208–203V, three-phase, 60 Hz
7.5 to 12.5 kW – 460V, three-phase, 60 Hz
 - Stage two
2.5 to 10.0 kW – 208–230V, one-phase, 60 Hz

Hot Water Heating Option

- Aluminum hot water coil
- Control valve is field installed
- ERV1100w: 50,000 to 70,000 Btu/hr [14.6 to 20.5 kW]
- ERV2000w: 60,000 to 90,000 Btu/hr [17.5 to 26.3 kW]

Proportional Electric Heat Option

- Stage one
 - 2.5 to 5.0 kW – 208–230V, one-phase, 60 Hz
 - Proportional control
5.0 to 12.5 kW 208–230V, three-phase, 60 Hz
7.5 to 12.5 kW 460V, three-phase, 60 Hz
- Stage two
 - 2.5 to 10.0 kW – 208–230V, one-phase, 60 Hz

Hot Gas Reheat Option

- Aluminum fin reheat coil
- ERV1100w: 30,000 to 40,000 Btu/hr [8.8 to 11.7 kW]
- ERV2000w: 40,000 to 50,000 Btu/hr [11.7 to 14.6 kW]

Installation

Rough In

The wallmount ventilator must be installed on a level base. Refer to [Appendix A](#) dimensions. Zero clearance is allowed between the bottom of the unit and any combustible material.

Unit Installed without Top Plenum

The supply air ducting must be connected to the supply collar and constructed so that there are no openings within 30" [762 mm] of the electric heating elements. Openings within 30" [762 mm] of the elements must be fitted with a permanent, non-removable protective screening. Zero clearance is required between the supply duct and any combustible material.

Drainage

Units equipped with air conditioning have a condensate line connected to the drain pan which drains out the back of the unit. Drain connections within the case are accessible by removing the access doors.

A water trap is provided in the drain line to prevent back flow of sewer gases. The drain must be installed in an area in which it will not freeze.

Water Supply

Never operate the heat pump without water flowing through its water-to-refrigerant heat exchanger coil; doing so would cause severe damage to the unit. For proper water flow rates, refer to the unit Product Data Manual.

Power

WARNING

Ensure that the power disconnect switch is off before connecting power to the unit or working with high voltage lines.

A sealed strain relief clamp (supplied by the Installer) must be fitted into the case to accommodate a power line connection (see [Appendix A](#) for knock-out location). If a sealed clamp cannot be used, the hole must be sealed with silicone or an equivalent water/air-tight sealant. Power must be connected to the unit through a fused disconnect switch (factory supplied option, field installed). If the unit has a top supply plenum, a hole for the power must be field drilled in the plenum to accommodate the main power in.

Terminals for line connection are located in the control box within the wallmount ventilator and are labeled as shown below. Connections are illustrated in [Appendix E](#).

Single-phase

Line connection to 208 or 230 VAC, single-phase, 60 Hz for electric heat units:

Table 1: Line Connection to 208 or 230 VAC, Single-phase, 60 Hz for Electric Heat Units

L1	Hot
L2	Hot
N	Neutral
GND	Ground

Line connection to 120 VAC, 60 Hz is possible for units with hydronic heating or no heat options:

Table 2: Line Connection to 120 VAC, 60 Hz for Hydronic Heating or No Heat

L1	Hot
N	Neutral
GND	Ground

Three-phase

Line connection to 208, 230 or 460 VAC, three-phase, 60 Hz:

Table 3: Line Connection to 208, 230 or 460 VAC, Three-phase, 60 Hz

L1	Hot
L2	Hot
L3	Hot
GND	Ground

Electrical connections must be made in accordance with all applicable local codes and ordinances and with the current revision of the National Electric Code (ANSI/NFPA 70).

For more information on electrical data, see [Appendix D](#).

Controls

The wall units contain a stand alone controls package consisting of either a Direct Digital Controller (DDC) system or an optional no controls package for field installation and controls. The DDC system allows the units to operate in either a stand alone capacity or in conjunction with numerous units via a field provided networking system.

Stand Alone Controls (DDC)

The mainframe for the stand alone DDC system is the programmable DSC-T305 controller/keypad. The DSC-T305 functions as a digital controller, LCD display for visual reference and as a 16-button keypad for user access to change operation parameters or to complete unit diagnostics. This controller is located within the unit and therefore can only be accessed by opening the front door of the unit.

The DDC controller/keypad also may interface to expander modules (within the control box) to expand the input and output (IO) capabilities of the entire control system. Expander modules are deemed necessary based upon the requirements of the controls sequence.

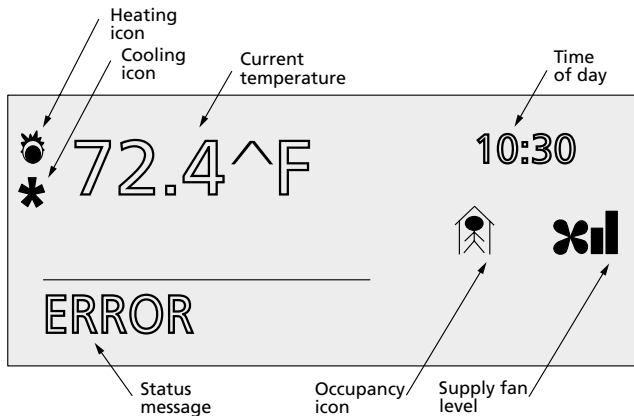


Figure 1: DSC-T305 controller display

IMPORTANT

For complete unit setup/configuration of the DDC controller system and outline of the troubleshooting guide, refer to the basic guide in [Appendix F](#) and the [Sequence of Operation](#) section for the DDC keypad operation. This guide is also placed within the unit for a more accurate description of the programmed parameters.

The default four-digit 'Pin' password for access to the DDC menus is "4321".

Remote Occupant Interface (BacStat II)

To provide remote monitoring and access of certain temperature setpoints and occupancy override features, a remote occupant interface option is available.

This interface is referred to as the BacStat II and is connected to the DDC (DSC-T305) controller via the terminal strip within the unit. Without the remote occupant inter-

face option, a 10K thermistor is connected to the terminal strip to provide the controller with the current room temperature. Refer to [Appendix E](#) for the wiring diagram of both the remote occupant interface and room sensor. Refer to the [Sequence of Operation](#) section for general operation of the remote occupant interface (BacStat II) keypad.

The remote occupant interface will allow a room occupant to adjust the room setpoint temperature and manually place the unit into occupancy override mode. By pressing the 'On' button, this mode can be obtained for durations of 60, 120 or 180 minutes. Pressing the 'On' button a fourth time will exit the occupancy override mode.

Room Temperature Sensor Wiring

Table 4: BacStat II Connections to Terminal Strip

BacStat II Sensor		Terminal Strip
24 VAC	Wired to	PWR 24V
GND	Wired to	COM
+	Wired to	NET +
-	Wired to	NET -

Without the BacStat II option, the room temperature is provided to the DDC controller via the wiring of a 10K thermistor. This thermistor must be connected to the terminal strip using a two-conductor shield cable, wiring one wire to the terminal '10K thermistor 1' and the other to the terminal '10K thermistor 2' (see [Appendix E](#)).

No Controls – Field Provided Low Voltage (Sequencing Required)

A no controls package could be supplied to enable the end user to field supply and install a custom control system. In this application, the unit would contain the factory wiring and installation of basic electrical components such as damper relays, fan relays, electric heat contactors, low voltage transformer and standard terminals and connectors.

General Wiring

Auxiliary heating (non-heat pump or electric units), auxiliary cooling (non-heat pump units) and 24 VAC connections are available for field wiring on the unit terminal strip. Each of the auxiliary terminals provide 24 VAC during the applicable stage (ex. 24 VAC on auxiliary cooling terminal during cooling modes) while the 24 VAC terminals provide approximately 30 VA of power output.

⚠ WARNING

Installation and operation of field supplied controls must provide the correct designed operation criteria of the unit. Incorrect unit operation could void the warranty of certain unit components and/or result in complete unit failure.

Balancing

Once installed, the unit must operate with balanced ventilation. Balanced ventilation is achieved by obtaining equal rates of outdoor and exhaust airflow. Airflow may be adjusted by balancing dampers (supplied by Installer) within the ductwork. Outdoor air volumes can be adjusted by changing the maximum open position on the opposed blade outdoor air damper. Supply airflow can be adjusted on both low and high speed using the ECM motor cfm adjustment procedure in [Appendix H](#).

Systems not operating with balanced airflow will not have effective energy recovery. Performance of the energy recovery module will be reduced and freezing may occur with cold outside air temperatures, resulting in blockage of the energy recovery module.

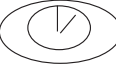
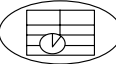
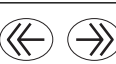
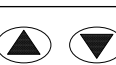
System Operation

Sequence of Operation

Many parameters on the DDC controller may be adjusted to alter the durations and setpoints of the sequence of operation of the wall unit. Refer to [Appendix F](#) and the Controls section for more specific details of each parameter.

DDC Controller/Keypad (DSC-T305)

Table 5: DDC Controller/Keypad (DSC-T305)

Symbol	Key Name	Description
	Thermometer key	Used to display the room setpoint.
	Clock key	Used to display the time and date.
	Schedule key	Used to display 'On' and 'Off' times.
	Occupancy key	Used to initiate manual occupancy.
	Parameter keys	Used to cycle through parameters.
	Increment keys	Used to increase or decrease values.

Remote Occupant Interface (BacStat II) Keypad

Table 6: Remote Occupant Interface (BacStat II) Keypad

Symbol	Key Name	Description
	Increment keys	Used to increase or decrease values.

Heating/Cooling Operation

First/Second Stage Heating

- 24 VAC on auxiliary heating terminal.
- Supply fan to low speed.

First Stage Cooling (Free Cooling)

- Supply fan to high speed.
- Wheel rotation is off.

Second Stage Cooling (Air Conditioning)

- 24 VAC on auxiliary cooling terminal.
- Supply fan to high speed.
- Wheel rotation is on.

Ventilation

Ventilation time periods will be determined through the schedule programming of the DDC system. Using the DDC keypad, the operator is able to select the on and off times on

a daily, weekly or monthly basis. Refer to [Appendix F](#) and the Sequence of Operation section for adjustment of the ventilation schedule.

Mode Cooling

First stage cooling puts the supply fan and exhaust fan to high speed and stops the energy recovery wheel. Second stage cooling is an option and calls for Dx cooling from ei-

ther a WSHP or a remote condensing unit. The supply fan runs on high speed and the energy recovery wheel rotates.

Recirculation Control

In ventilation mode, the outside air damper is open and the supply air is a mixture with a percentage of return air. In recirculation mode, the ventilation damper is closed and 100% of the supply air is recirculated air from the return plenum.

Units equipped with recirculation control are built with a damper mechanism controlling air flow through the intake duct. Ventilation mode is activated by the DDC controller schedule.

Frost Control

Recirculation and Exhaust Only Defrost

These two frost control strategies consist of a timer/controller that is activated by a thermistor which monitors the outside air temperature passing through the air intake. When the unit is in ventilation mode at defrost temperatures, the timer/controller activates frost control periodically to keep the enthalpy wheel free from frost.

VSD (Variable Speed Drive) Frost Prevention

The VSD frost prevention strategy is achieved by modulating the rotational speed of the enthalpy wheel to maintain an exhaust air temperature of 33°F [1°C].

System Service Monthly Maintenance

⚠ WARNING

Disconnect the main power switch to the unit before performing service or maintenance procedures.

Air Filters

The standard medium efficiency filters are disposable and should be replaced monthly or as required by operating conditions. When installing a new filter, the airflow arrow should point in the direction of the enthalpy wheel. To remove the supply filter, open the bottom access door and pull out the filter as shown in Figure 2. To remove the exhaust filter, remove the bottom access door and pull out the filter as shown in Figure 3.

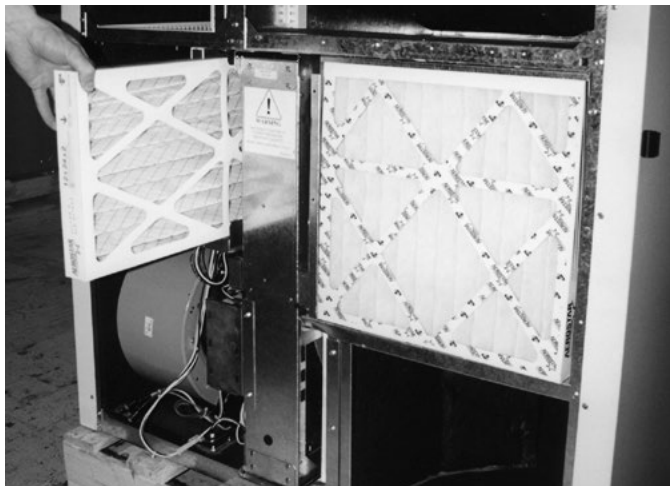


Figure 2: Supply filter

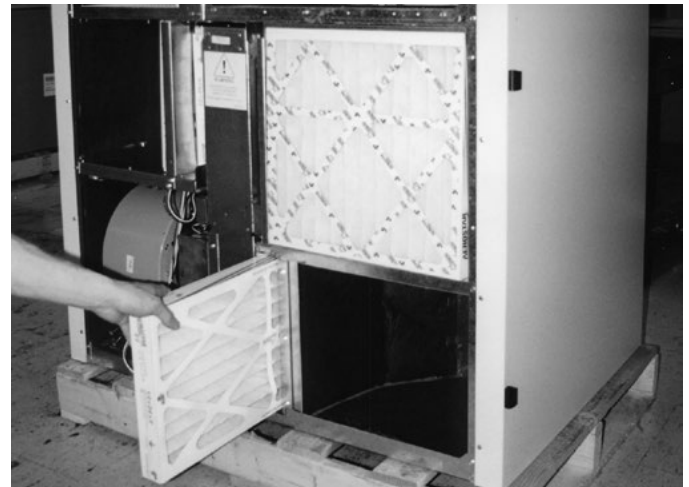


Figure 3: Exhaust filter

Annual Maintenance

⚠ WARNING

Disconnect the main power switch to the unit before performing service or maintenance procedures.

Interior of Unit

The inside of the unit should be vacuumed or wiped clean annually with a soft cloth and mild cleaning solution. Check the drain fittings (if equipped) to ensure they are draining freely.

Enthalpy Wheel

No cleaning of the enthalpy wheel is required. It is self-cleaning due to the opposing airflows. If the enthalpy wheel is cleaned, use low pressure air or a vacuum. Visually inspect the cassette brush seals and drive belt for proper operation. See Figure 4.

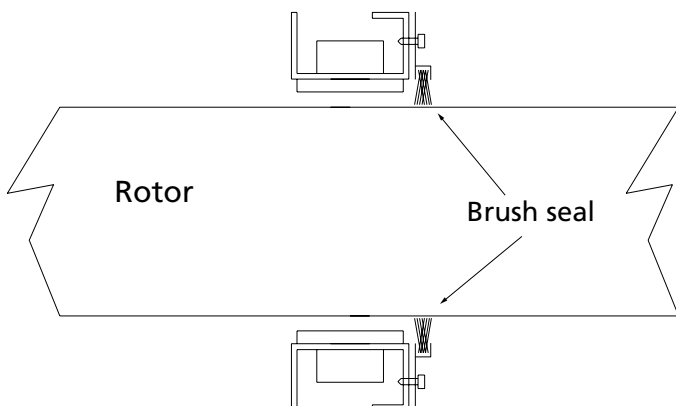


Figure 4: Brush seal

Heaters/Air Conditioning Coils

Check the duct heaters, hot water coils and air conditioning coils for obstruction or buildup of dust. Check the manual reset button on your duct heaters (if the unit has electric heat). If the red buttons are released out, depress the red button to reset the switch. If this problem persists, call a qualified electrical technician for analysis.

Dampers

Check dampers for obstruction and cleanliness.

Fans

Blower wheels and fan housings should be checked for dust buildup. If excessive dust buildup exists, it will be necessary to remove the blower assembly to clean the dust out through the fan mouth.



Figure 5: Loosen wing nut to remove blower



Figure 6: Disconnect electrical plugs



Figure 7: Removing the supply blower

Appendix A: Unit Dimensions

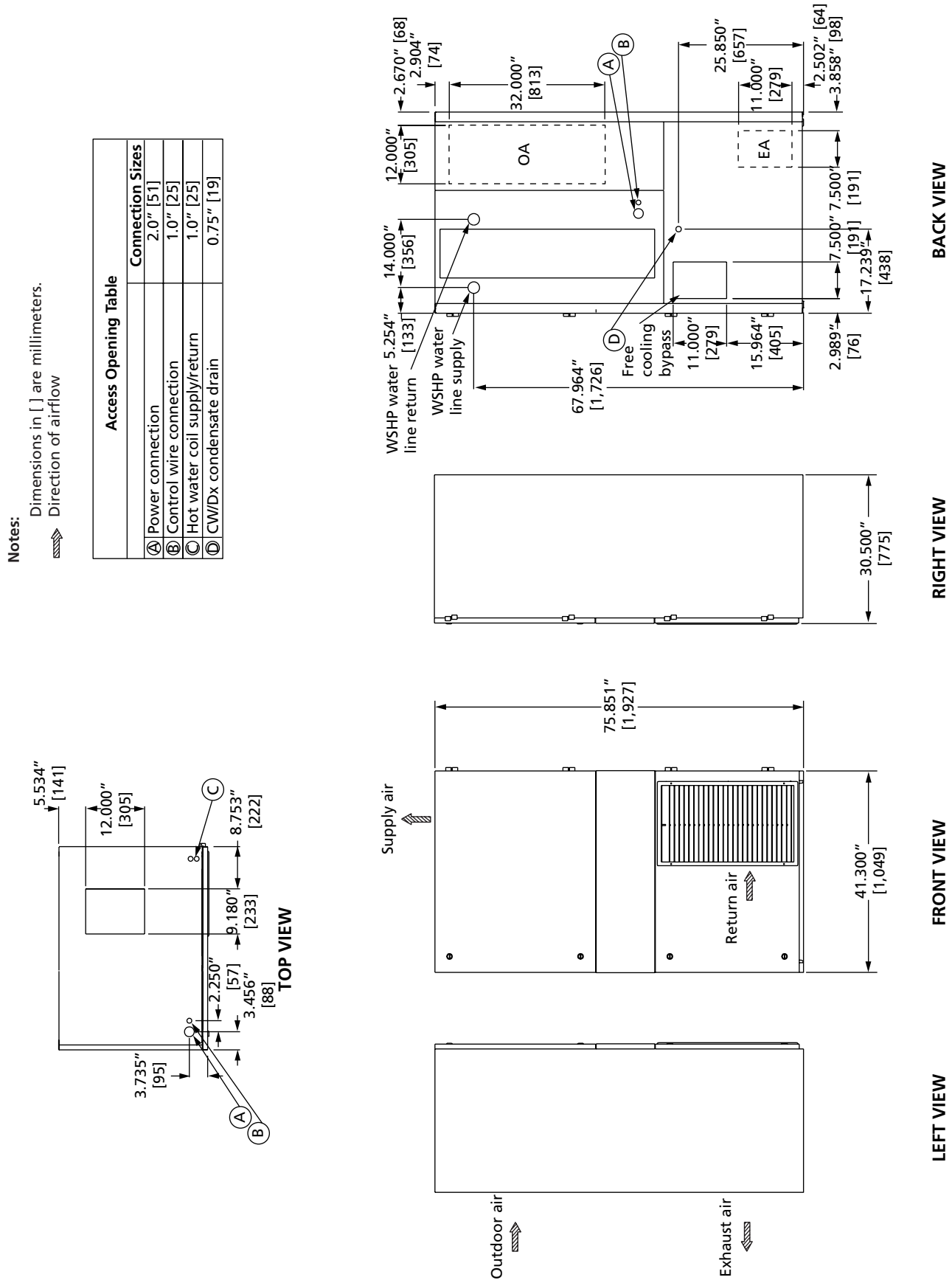


Figure A1: ERV1100w unit dimensions

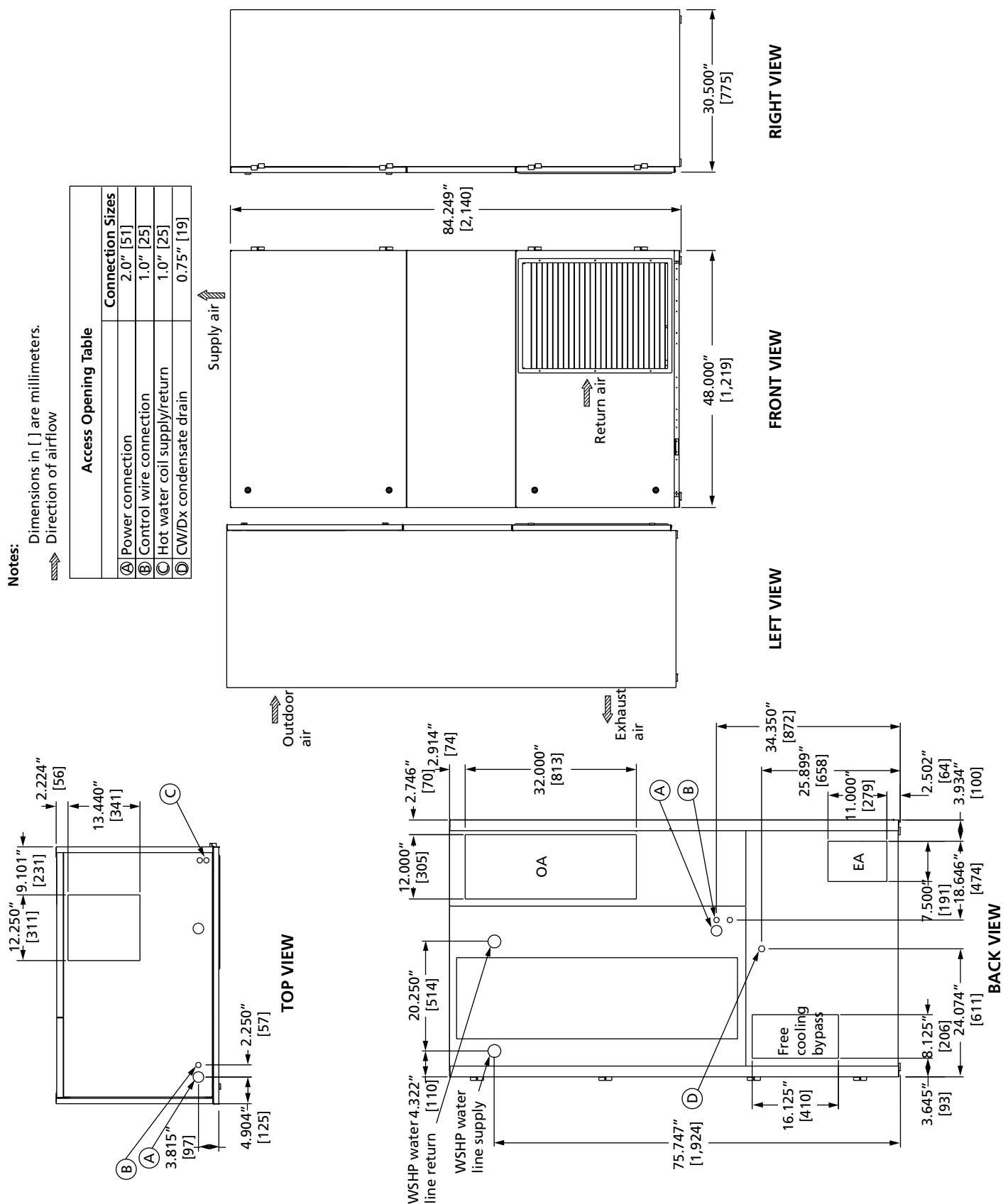
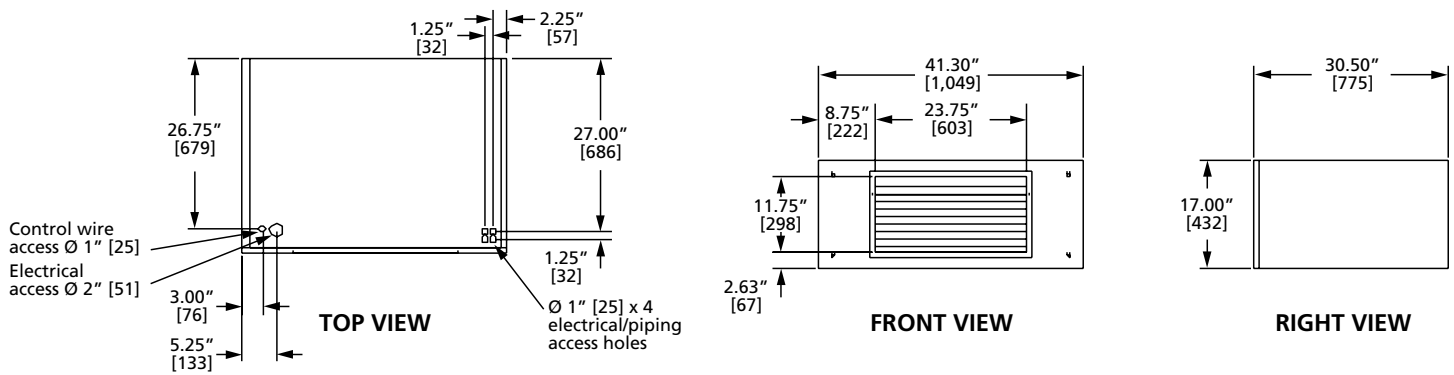


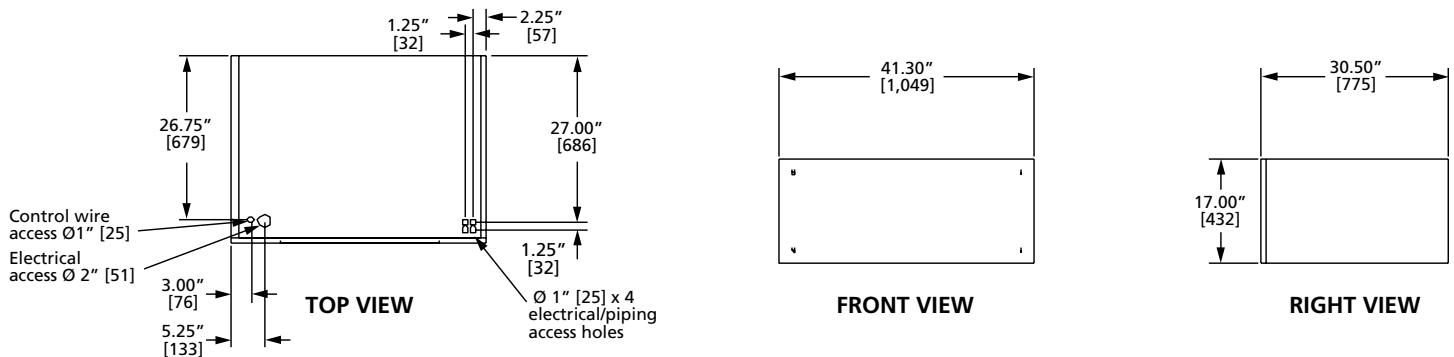
Figure A2: ERV2000w unit dimensions

Appendix B: Plenum Dimensions



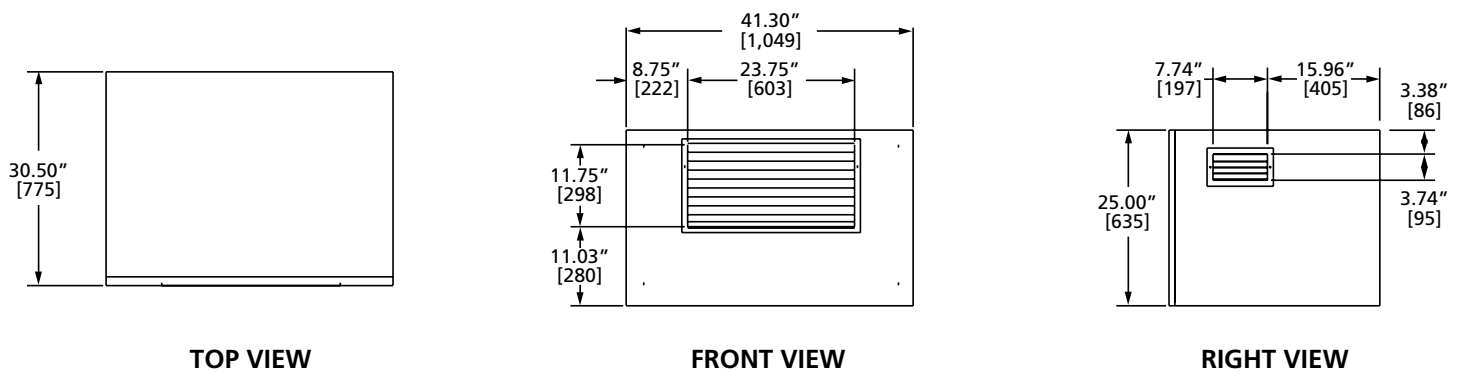
Note: Dimensions in [] are millimeters.

Figure B1: ERV1100w standard plenum dimensions



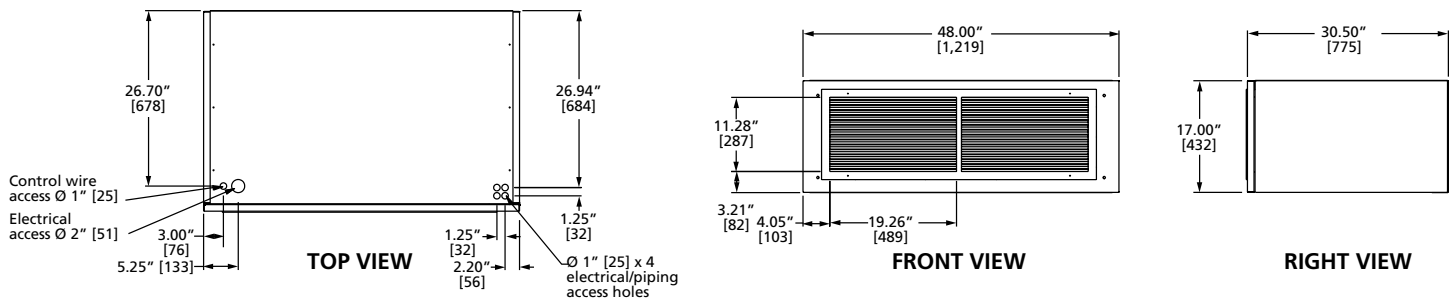
Note: Dimensions in [] are millimeters.

Figure B2: ERV1100w ducted plenum dimensions



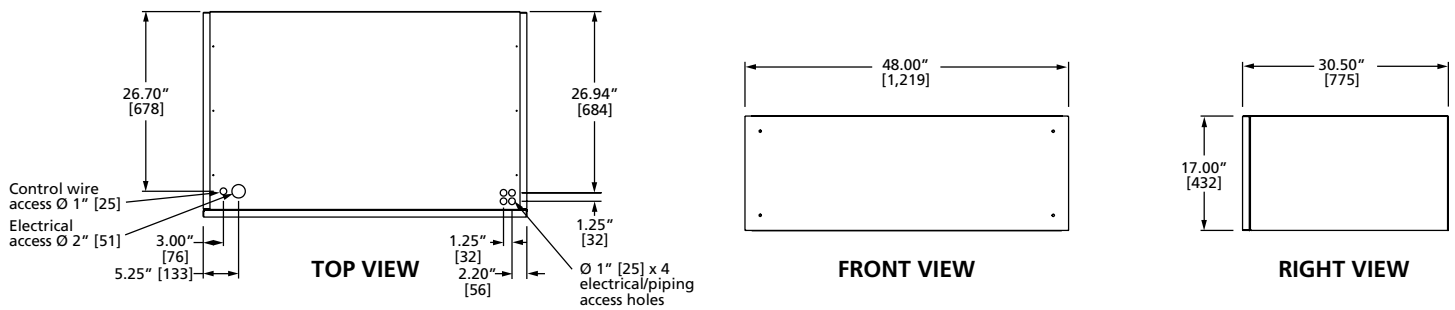
Note: Dimensions in [] are millimeters.

Figure B3: ERV1100w silencer plenum dimensions



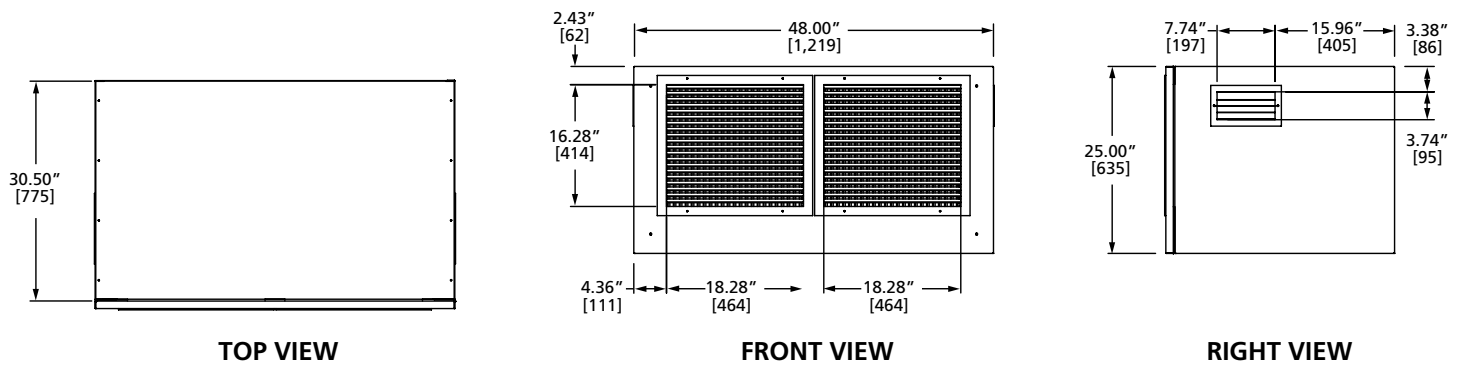
Note: Dimensions in [] are millimeters.

Figure B4: ERV2000w standard plenum dimensions



Note: Dimensions in [] are millimeters.

Figure B5: ERV2000w ducted plenum dimensions



Note: Dimensions in [] are millimeters.

Figure B6: ERV2000w silencer plenum dimensions

Appendix C: Airflow Performance Data

ERV1100w

Outdoor Air Damper Position Selection

With the outdoor air (OA) and return air (RA) dampers fully open, the airflow values are given in the chart on the following page. OA volume is approximately 53% of total air (TA) with both dampers fully open. The following procedure shows how to determine the OA damper position to set the amount of OA available.

Example

- Desired TA for heating is 900 cfm.
- Desired TA for cooling is 1,200 cfm.
- Desired OA is 450 cfm.
- Unit configuration is hydronic heat and Dx cooling.

Since the worst case design is in the heating mode at 900 cfm TA, we need to start here.

Procedure

1. If this OA volume is too high, calculate the desired percentage of OA volume to TA volume required.
Example: You want 450 cfm OA and 900 cfm TA so $450/900 = 50\%$ OA.
2. Determine the appropriate OA damper position to achieve the OA volume of 450 cfm by finding 50%

on the right hand Y axis—Outside Air Percentage (% of Fully Open Supply Side Volume)—and run across to the Outside Air Curve (see #1 below). 50% equates to 42° open OA damper or 5.5 VDC for modulating damper actuator.

3. Find the new TA volume by running vertically from point #1 on the 42° open line to the Total Air Curve and then horizontally to the left hand Y axis (see #2 below). In this example, the TA is 95.5% of full open which is $95.5\% \times 900 = 860$ cfm.
4. Find the corrected OA volume by multiplying the desired % OA volume (50%) by the new TA volume (860 cfm). Example: $50\% \times 860 = 430$ cfm OA.
5. To find the damper setting for high speed cooling (1,200 cfm) the same procedure may be followed. In this example, $450/1,200 = 38\%$ which is less than the minimum recommended amount of 41% (4 VDC or 24° open). This means that the damper should only be set to the minimum open position of 24° (or 4 VDC). The resultant TA amount will be $91\% \times 1,200 = 1,092$ cfm with an OA amount of $41\% \times 1,092 = 448$ cfm.

Modulating Outdoor Air Damper System Response

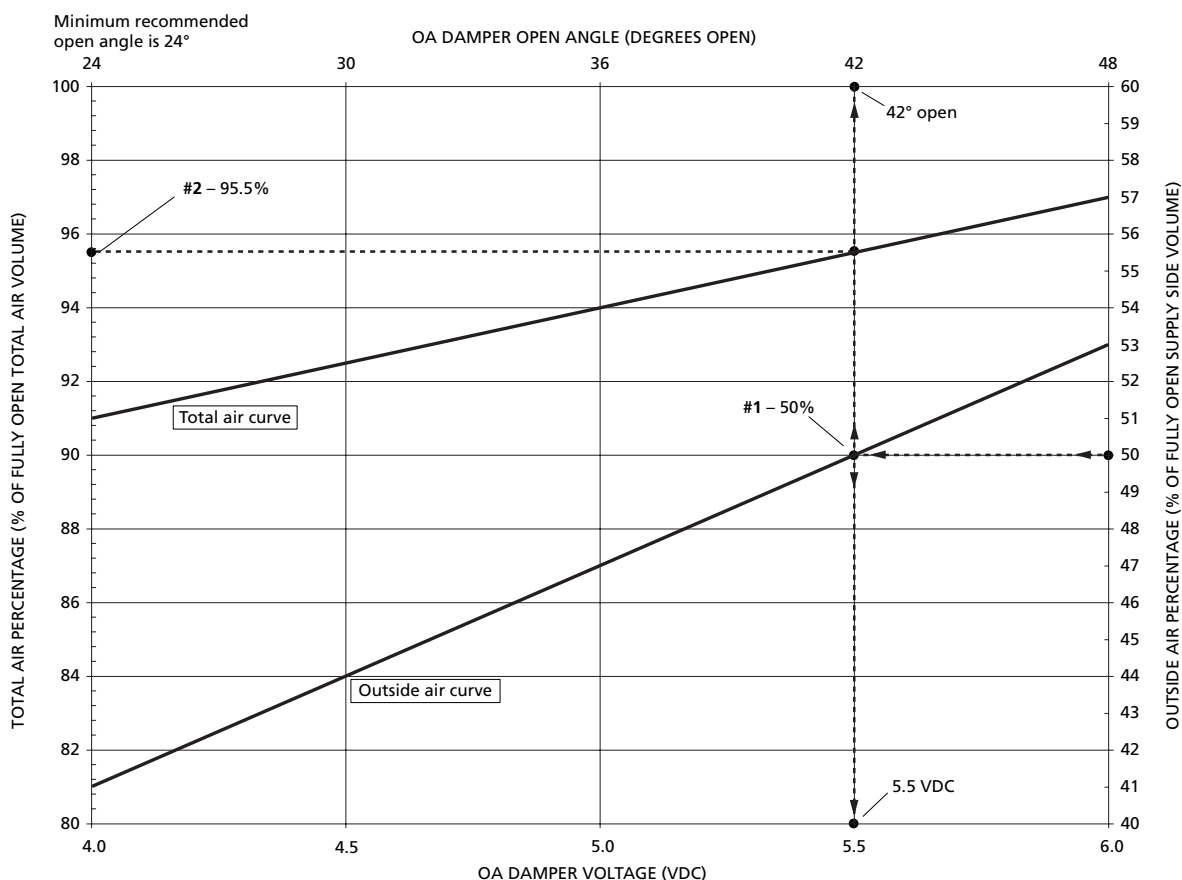


Figure C1: ERV1100w airflow performance

Table C1: ERV1100w Airflow Performance Data

Fan Speed	External Static Pressure (in. w.g.)														Airflow High/Low Speed Setting Variable Between CFM Range			
	0.0		0.1		0.2		0.3		0.4		0.5		0.6					
	TA	OA	TA	OA	TA	OA	TA	OA	TA	OA	TA	OA	TA	OA				
Chilled Water Cooling with Electric Post-heat																		
High	1,200	636	1,200	636	1,200	636	1,100	583	N/A	N/A	N/A	N/A	N/A	N/A	TA	OA	TA	OA
Low	900	477	900	477	900	477	900	477	N/A	N/A	N/A	N/A	N/A	N/A	1,200	636	600	318
Chilled Water Cooling Only																		
High	1,200	636	1,200	636	1,200	636	1,100	583	N/A	N/A	N/A	N/A	N/A	N/A	TA	OA	TA	OA
Low	900	477	900	477	900	477	900	477	N/A	N/A	N/A	N/A	N/A	N/A	1,200	636	600	318
Water Source Heat Pump or Dx Cooling with Electric Post-heat																		
High	1,200	636	1,200	636	1,200	636	1,150	610	1,150	610	1,100	583	N/A	N/A	TA	OA	TA	OA
Low	900	477	900	477	900	477	900	477	900	477	900	477	N/A	N/A	1,200	636	600	318
Water Source Heat Pump or Dx Cooling																		
High	1,200	636	1,200	636	1,200	636	1,150	610	1,150	610	1,100	583	N/A	N/A	TA	OA	TA	OA
Low	900	477	900	477	900	477	900	477	900	477	900	477	N/A	N/A	1,200	636	600	318
Electric Heat Only																		
High	1,200	636	1,200	636	1,200	636	1,200	636	1,200	636	1,200	636	1,200	636	TA	OA	TA	OA
Low	900	477	900	477	900	477	900	477	900	477	900	477	900	477	1,200	636	600	318
Chilled Water Cooling with Hot Water Post-heat																		
High	1,200	636	1,150	610	1,150	610	1,100	583	N/A	N/A	N/A	N/A	N/A	N/A	TA	OA	TA	OA
Low	900	477	900	477	900	477	900	477	N/A	N/A	N/A	N/A	N/A	N/A	1,100	583	600	318
Hot Water Heat Only																		
High	1,200	636	1,200	636	1,200	636	1,150	610	1,150	610	1,100	583	N/A	N/A	TA	OA	TA	OA
Low	900	477	900	477	900	477	900	477	900	477	900	477	N/A	N/A	1,200	636	600	318
Water Source Heat Pump or Dx Cooling with Hot Water Post-heat or Hot Gas Reheat																		
High	1,200	636	1,200	636	1,200	636	1,100	583	N/A	N/A	N/A	N/A	N/A	N/A	TA	OA	TA	OA
Low	900	477	900	477	900	477	900	477	N/A	N/A	N/A	N/A	N/A	N/A	1,200	636	600	318
Gas Heat																		
High	1,200	636	1,200	636	1,200	636	1,175	623	1,150	610	1,125	596	1,100	583	TA	OA	TA	OA
Low	900	477	900	477	900	477	900	477	900	477	900	477	900	477	1,200	636	600	318

Outdoor air values are maximums. These volumes can be decreased using the outside air damper/maximum open setting.

Airflow high/low valves may be set within the variable cfm range.

Outdoor airflows are representative of actual air being delivered to the space. 50 cfm cross leakage has been subtracted from airflow measured at the outdoor air damper.

All airflow measurements have been made in accordance with the Air Movement and Control Association (AMCA) 210 method of testing.

ERV2000w

Outdoor Airflow Adjustment

If the desired outside airflow is less than the value shown in the ERV2000w airflow performance data table (see Table C2), the amount of airflow can be reduced by partially closing the outside air inlet damper. Please note that the total airflow will be affected when adjusting the outside air damper. To determine the amount that the outside air damper must be closed, divide the desired flow by the rated outside airflow from Table C2.

Example

- 4 ton WSHP at 0.3 ESP and 500 cfm desired outside airflow.
- From ERV2000w airflow performance data table: TA = 1,800 cfm and OA = 576 cfm.

Procedure

1. Divide desired airflow by outside airflow rate:
 $500/576 = 0.87$.
2. From outside air damper curve (below): 28° outside air damper setting.
3. New total airflow is: $1,800 \times 0.94 = 1,692$ cfm.
4. Airflow in unoccupied: $1,800 \times 0.90 = 1,620$ cfm.

Outside Air Damper Curve

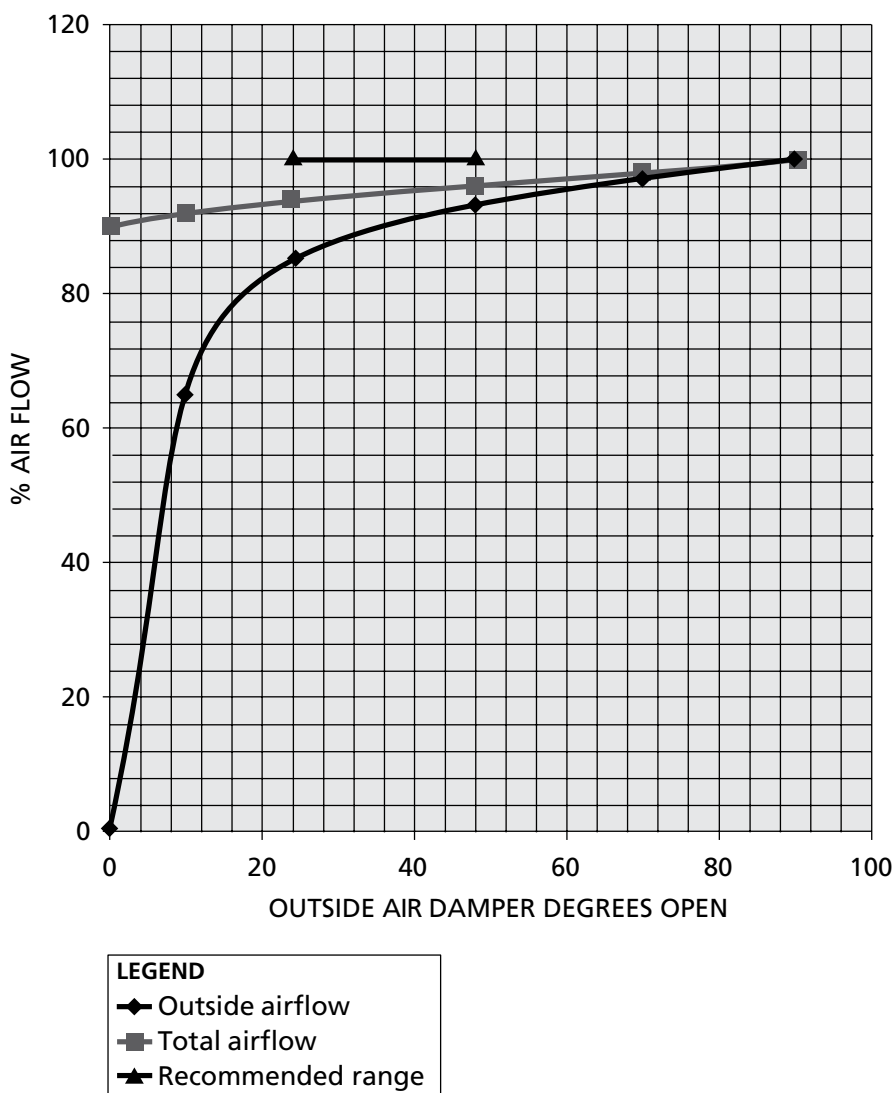


Figure C2: ERV2000w airflow performance

Table C2: ERV2000w Airflow Performance Data

Chilled Water Cooling with Electric Post-heat																	
Chilled Water Cooling Only																	
Water Source Heat Pump or Dx Cooling with Electric Post-heat																	
Water Source Heat Pump or Dx Cooling																	
Electric Heat Only																	
Chilled Water Cooling with Hot Water Post-heat																	
Hot Water Heat Only																	
Water Source Heat Pump or Dx Cooling with Hot Water Post-heat																	
Water Source Heat Pump with Hot Gas Reheat																	
Capacity	Fan Speed	External Static Pressure (in. w.g.)												Airflow High/Low Speed Setting Variable Between CFM Range			
		0.0		0.1		0.2		0.3		0.4		0.5					
		TA	OA	TA	OA	TA	OA	TA	OA	TA	OA	TA	OA				
4 and 5 ton	High	2,000	640	2,000	640	2,000	640	2,000	640	2,000	640	2,000	640	TA	OA	TA	OA
	Low	1,800	576	1,800	576	1,800	576	1,800	576	1,800	576	1,800	576	2,000	640	900	288
3 and 3.5 ton	High	1,600	512	1,600	512	1,600	512	1,600	512	1,600	512	1,600	512	TA	OA	TA	OA
	Low	1,400	448	1,400	448	1,400	448	1,400	448	1,400	448	1,400	448	1,600	512	900	288

Outdoor air values are maximums. These volumes can be decreased using the outside air damper/maximum open setting.

Airflow high/low valves may be set within the variable cfm range.

For the 3 and 3.5 ton units, the return air (RA) damper is 30% open. Outdoor air (OA) can be reduced by partly closing the OA inlet damper.

Appendix D: Electrical Data

Table D1: ERV1100w Blower Motors Full Load Amperage (FLA)

HP	Voltage					
	120/1/60	208/1/60	230/1/60	208/3/60	230/3/60	460/3/60
¼ (exhaust)	4.80	2.20	2.20	2.20*	2.20*	1.10*
½ (supply – no gas)	5.80	3.40	3.40	3.40*	3.40*	1.20*
¾ (supply with gas)	8.00	8.00**	8.0**			

Table D2: ERV2000w Blower Motors Full Load Amperage (FLA)

HP	Voltage					
	120/1/60	208/1/60	230/1/60	208/3/60	230/3/60	460/3/60
¼ (exhaust)	4.80	2.20	2.20	2.20*	2.20*	1.10*
½ (1,200–1,600 CFM)	5.80	3.40	3.40	3.40*	3.40*	1.20*
1 (2,000 CFM)	10.50	5.80	5.80	5.80*	5.80*	2.90*

Table D3: ERV1100w and ERV2000w Heaters (FLA)

kW	Voltage					
	120/1/60	208/1/60	230/1/60	208/3/60	230/3/60	460/3/60
2.5		12.02	10.87	6.95	6.28	3.14
5.0		24.04	21.74	13.90	12.57	6.28
7.5				20.84	18.85	9.42
10.0				27.79	25.13	12.57
12.5				34.74	31.41	15.71

Table D4: ERV1100w and ERV2000w Compressors – One-stage, R410a (FLA)

Tons	Voltage					
	120/1/60	208/1/60	230/1/60	208/3/60	230/3/60	460/3/60
2.0		15.00	15.00	9.30	9.30	5.00
2.5		18.60	18.60	10.40	10.40	6.30
3.0		20.70	20.70	15.50	15.50	7.10
3.5		24.70	24.70	20.70	20.70	6.90
4.0		30.00	30.00	19.60	19.60	10.70
5.0		33.60	33.60	22.90	22.90	10.70

Table D5: ERV1100w and ERV2000w Compressors – Two-stage, R410a (FLA)

Tons	Type	Voltage		
		208/230/1/60	208/230/3/60	460/3/60
2.0	Two-stage	13.00	7.20	3.90
2.5	Two-stage	17.00	12.90	6.40
3.0	Two-stage	20.00	15.80	6.90
3.5	Two-stage	23.60	15.60	7.10
4.0	Two-stage	32.10	18.10	8.50

Table D6: ERV1100w and ERV2000w Wheels and Controls (FLA)

	Voltage					
	120/1/60	208/1/60	230/1/60	208/3/60	230/3/60	460/3/60
	2.73	2.73	2.73	1.58*	1.58*	0.71*

The following notes apply to the above tables:

All three-phase units have 208/230 VAC/1/60 fan motors

* Primary side of the transformer.

** 120 VAC/1/60 motor used.

*** Supply blower for units with gas heating only.

Shaded areas indicate the voltage is not available.

Appendix E: Remote Occupant Interface

The BacStat is connected to the unit using a four-conductor cable. Shielded cable should be used for the BacStat wiring and standard thermostat installation practices should be used. Avoid mounting the BacStat near any sources of heat or in places where airflow is restricted. The BacStat should be accessible to the occupant.

The BacStat wires must run to the control terminal strip inside the unit. This terminal strip may have a wide variety of hardware and networking outputs (depending on the unit type and its configuration), but the BacStat connection is always clearly marked. The drawing below shows the BacStat wiring for a typical hydronic unit.

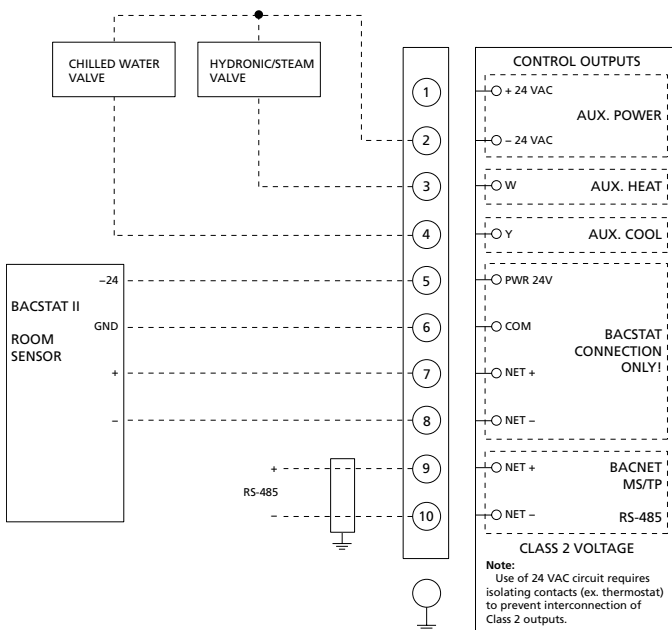


Figure E1: Remote occupant interface

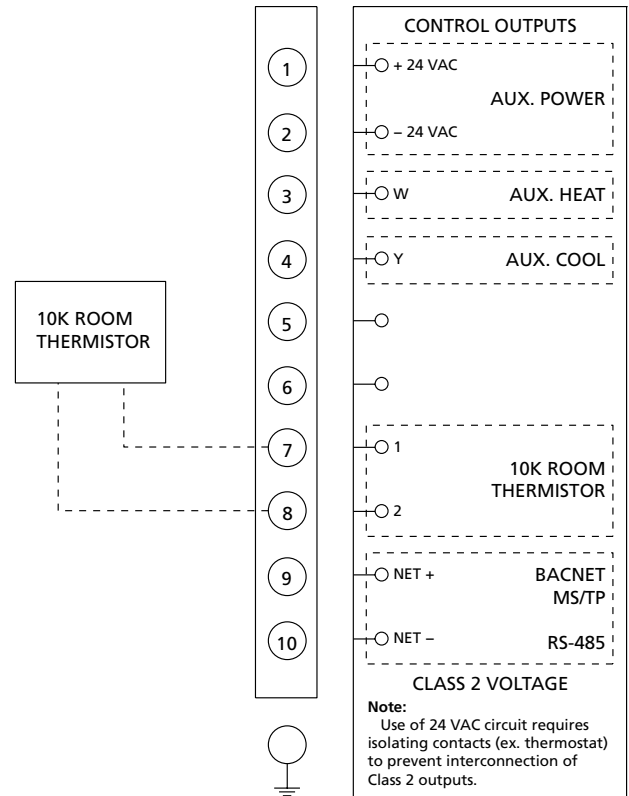
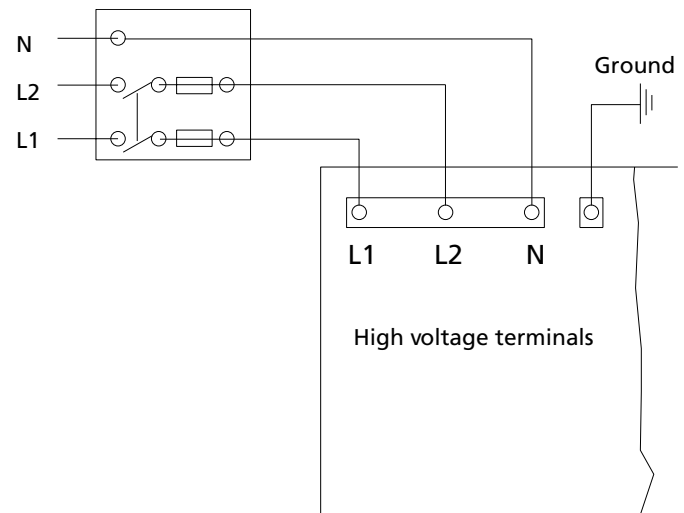


Figure E2: Room sensor – 10K thermistor



Notes:

1. Fused disconnect switch supplied by Installer.
2. 208–230 VAC/120/1/60 requires a neutral wire to be run with L1 and L2.
3. For 120/1/60 volt units, L2 is not required.

Figure E3: Single-phase power supply wiring

Appendix F: DDC Keypad Reference Guide

Unit Setup and Configuration

Using the Keypad Controls

Values are changed using the up and down arrow keys.

Adjusting Room Setpoint

Press the 'Thermometer' key. The room setpoint will be displayed and may be altered using the up and down arrow keys (factory set at 72°F [22°C]). Pressing the 'Thermometer' key again will enter the selected setting(s).

Adjusting Date and Time

Press the 'Clock' key. Cycle through the time and date fields using the left and right arrow keys and adjust the values using the up and down arrow keys. Pressing the 'Clock' key again will enter the selected setting(s).

Setting the Schedule

Press the 'Schedule' key. Cycle through the daily on and off times with the left and right arrow keys. Adjust the time with up and down arrow keys. To change the time increment (ex. hours to minutes) hold the 'Occupied' key down while using the up and down arrow keys to change the value. Pressing the 'Schedule' key again will enter the selected setting(s).

Troubleshooting Quick Reference Guide

Entering the Menu Mode

To enter the menu mode, hold down the left and right arrow keys at the same time for a few seconds until the word 'Pin' appears on the display. Enter the 'Pin' number. At this point, the controller will enter the menu mode, displaying one of the three menus listed below.

Selecting Menu and Sub-menus

Refer to Table F1.

Use the number keys to select the appropriate menu and the left and right keys to alternate between the sub-menus.

Selecting Individual Parameters and Settings

Refer to Table F1.

Use the left and right arrow keys to cycle through the individual parameters and the up and down arrow keys to change the available settings.

Table F1: DDC Keypad Reference Guide

Menu	Sub-menu	Parameter	Settings	Comments
Manual Control Display – Ctrl Button ‘1’ on keypad	Manual Mode Display – Man Mode Only one mode may be manually active at any time	Occupied ventilation	Active/inactive	Unit will go into a standby mode while user is in manual control of outputs.
		Occupied heating	Off/stage 1/2/3/4	
		Occupied cooling	Off/stage 1/2/3	
		Unoccupied heating	Off/stage 1/2/3/4	
		Unoccupied cooling	Off/stage 1/2/3	
System Diagnostics Display – Diag Button ‘2’ on keypad System will continue to operate normally while in diagnostic mode	Input Monitor Display – IP Montr	OA temperature	Value from sensor	* Display only – not adjustable.
		Mixed air temperature	Value from sensor	* Display only – not adjustable.
		Coil leaving air temperature	Value from sensor	* Display only – not adjustable.
		Discharge air temperature	Value from sensor	* Display only – not adjustable.
		Exhaust air temperature	Value from sensor	* Display only – not adjustable.
		Coax water temperature	Value from sensor	* Display only – not adjustable.
	System Values Display – Sys Valu	Cooling controller	Value from controller	* Display only – not adjustable.
		Heating controller	Value from controller	* Display only – not adjustable.
		Cooling stage	0, 1, 2, 3	* Display only – not adjustable.
		Heating stage	0, 1, 2, 3, 4	* Display only – not adjustable.
		Defrost flag	On/off	* Display only – not adjustable.
		Free cooling flag	On/off	* Display only – not adjustable.
		Program ID	ID #	* Display only – not adjustable.
System Configuration Display – Cfg Button ‘3’ on keypad	Setpoint Adjustment Display – SP Adj	Free cooling setpoint	0°F to 70°F, set at 68°F [–18°C to 21°C, set at 20°C]	
		Unoccupied cooling setpoint	Unoccupied heat 80°F, set at 76°F [27°C, set at 24°C]	
		Unoccupied heating setpoint	0 to unoccupied cooling, set at 65°F [–18°C to unoccupied cooling, set at 18°C]	
		OAD min position	0% to 100%, set at 50%	Modulating actuator only.
		Humidity setpoint	0% to 100% RH, set at 50% RH	Units with reheat only.
		Discharge cooling setpoint	40°F to 65°F, set at 50°F [4°C to 18°C, set at 10°C]	
		Discharge heating setpoint	50°F to 105°F, set at 90°F [10°C to 41°C, set at 32°C]	
		Defrost setpoint	–5°F to 50°F, set at 5°F** [–21°C to 10°C, set at –15°C]	** 33°F for VSD frost prevention [1°C for VSD frost prevention].
	Controller Settings Display – CO Setup	Heating prop band	0°F to 20°F, set at 4°F [–18°C to –7°C, set at –16°C]	4°F [–16°C] = +/- 2°F
		Heating reset rate	0 to 100%, set at 2%	2% = 2% bias change/minute
		Cooling prop band	0°F to 20°F, set at 4°F [–18 to –7°C, set at –16°C]	4°F [–16°C] = +/- 2°F
		Cooling reset rate	0 to 100%, set at 2%	2% = 2% bias change/minute
		Units	Metric/US	* Recommend to power down the unit after changing this setting.
		Dx cooling	On/off	Enables/disables Dx cooling.
Exit Menus Button ‘5’ on keypad	Display – Exit	Exit	Yes/no	

Appendix G: Start-up and Troubleshooting

Before powering the unit, check the following:

- High voltage is correct and matches the nameplate.
- Fuses, breakers and wire sizes are correct.
- Low voltage wiring is completed.
- Piping is completed and water system has been cleaned and flushed.
- Isolation valves are open and loop water control valves or loop pumps are wired.
- Service/access panels are in place.

Unit Start-up

1. Set control above cooling setpoint.
2. Slowly reduce the control setting until both the compressor and water control valve are activated. Verify that the compressor is on and the water flow rate is correct.
3. After operating the unit for a few minutes, check that the unit is functioning properly by providing satisfactory cooling.

4. Adjust control below heating setpoint.
5. Slowly increase the control setting until both compressor and water control valve are activated.
6. After operating the unit for approximately ten minutes, check the supply air temperature to ensure the unit is providing satisfactory heating.
7. Check for vibrations, noise and water leaks.
8. Set system to maintain desired setpoint.
9. Instruct the owner/operator of correct control and system operation.

Troubleshooting

Should a major problem develop, refer to the following information for possible causes and corrective steps.

Table G1: ERV1100w and ERV2000w Troubleshooting

Problem	Cause	Solution
Sufficient cooling or heating is not obtained.	Restricted water flow.	Check for restriction in water flow.
	Low refrigerant charge.	Check refrigerant subcooling and superheat for low refrigerant charge.
	The reversing valve may be defective and creating a bypass of refrigerant.	If the unit will not cool, check the reversing valve coil.
	Restricted refrigerant flow.	Check thermal expansion valve for possible restriction of refrigerant flow.
Unit operation is noisy.	Loosened mounting bolts.	Check compressor for loosened mounting bolts. Make sure compressor is floating free on its isolator mounts.
	Tubing contact with compressor.	Check for tubing contact with the compressor or other surfaces. Re-adjust by bending slightly.
	Loose screws.	Check screws on all panels are in place and secured.
	Low voltage or defective holding coil.	Check for clattering or humming in the contactor or relays due to low voltage or a defective holding coil. Replace the defective component.
	Improper installation of vibration absorbing material.	Check for proper installation of vibration absorbing material under the unit.
	Improper unit support.	Unit must be fully supported, not just on corners.
	Incorrect discharge pressures.	Check for abnormally high discharge pressures.
	Incorrect phasing.	Check for proper phasing.

Table G1: ERV1100w and ERV2000w Troubleshooting

Problem	Cause	Solution
Compressor will not run.	The fuse may be open or the circuit breaker may be tripped.	Check electrical circuits and motor windings for shorts or grounds. Investigate for possible overloading. Replace fuse or reset circuit breakers after fault is corrected.
	Supply voltage may be too low.	Check with a voltmeter.
	Control system may be faulty.	Check control for correct wiring and check the 24V transformer for proper voltage.
	Wires may be loose or broken.	Replace or tighten wires.
	The low pressure switch may have been tripped.	Heating: • Lack of water flow. • Water too cold. • Loss of refrigerant. Cooling: • Insufficient supply airflow. • Loss of refrigerant.
	The high pressure switch may have been tripped.	Heating: • Insufficient supply airflow. • Water too warm. Cooling: • Lack of water flow.
	The compressor overload protection may be open.	If the compressor dome is extremely hot, the overload will not reset until it has cooled down. If the overload does not reset when cool, it may be defective. If so, replace compressor.
	The internal wiring of the compressor motor may be grounded to the compressor shell.	Replace the compressor.
	The compressor winding may be open.	Check continuity with an ohmmeter. If winding is open, replace the compressor. Check thermostat setting, calibration and wiring.

Appendix H: ERV1100w and ERV2000w Start-up Report

Date: _____
Site Reference: _____
Job Number: _____
Unit Number: _____
Unit Type: _____
Room Number: _____
Installer: _____
Representative: _____
Service Technician: _____
Company: _____
Phone Number: _____

Installation Check

☐ Unit level.
☐ Unit bolted to floor or wall.
☐ Condensate drain correct.
☐ Wallsleeve correct.
☐ Wallsleeve insulated.
☐ Electrical connections tight.
☐ Damage to unit. Please describe: _____

Indoor Fan

Size: _____
Type: _____
FLA: _____

Fan Volts (L1 to M)

High: _____
Low: _____

Fan Current (L1)

High: _____
Low: _____

Outdoor Fan

Size: _____
Type: _____
FLA: _____

Fan Volts (L3 to M)

High: _____
Low: _____

Fan Current (L3)

High: _____
Low: _____

Compressor

Size: _____
Type: _____
RLA: _____

Running Current Cooling

L1: _____

L2: _____
L3: _____

Running Current Heating

L1: _____
L2: _____
L3: _____

Electric Heat

Stage 1 Current

L1: _____
L2: _____
L3: _____

Stage 2 Current

L1: _____
L2: _____
L3: _____

Mains Voltage

L1: _____
L2: _____
L3: _____

Control Voltage: _____

Refrigeration

Suction Pressure

Cooling Mode: _____
Heating Mode: _____

Discharge Pressure

Cooling Mode: _____
Heating Mode: _____

Superheat

Cooling Mode: _____
Heating Mode: _____

Air Temperatures

Return Air Temperature

Cooling Mode: _____
Heating Mode: _____

Supply Air Temperature

Cooling Mode: _____
Heating Mode: _____

Outside Temperature

Cooling Mode: _____
Heating Mode: _____

Coil Temperature

Cooling Mode: _____
Heating Mode: _____

Occupied Setpoint: _____

Unoccupied Setpoint: _____

Outstation Number: _____

Appendix I: ECM Motor CFM Adjustment Procedure

Step 1

Using a DMM set to measure VDC, record all current values for each of the Flo points. Measurement is made between Flo Com and the respective Flo test point. Record these values under Factory Set. Refer to Figure I1 to locate test points.

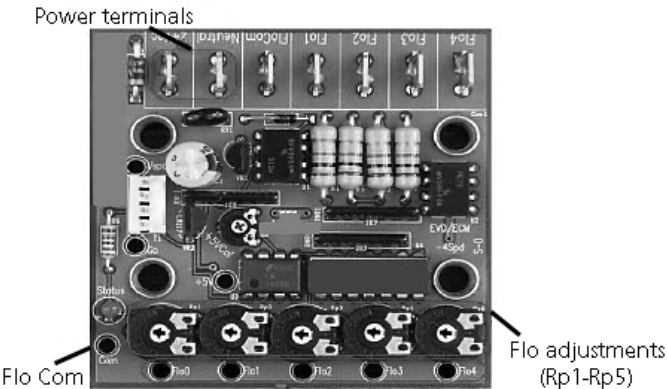


Figure I1: ECM test points

Step 2

If a voltage is present on Flo 0, that will be your low speed setting. If no voltage present on Flo 0 then Flo 1 is low speed. Each ascending Flo value corresponds to the next speed setting.

Decrease CFM

While measuring the Flo setting adjust the respective RP potentiometer counter-clockwise for that speed. A voltage decrease of 0.05 VDC will decrease the motor torque by one oz-ft.

Increase CFM

While measuring the Flo setting adjust the respective RP potentiometer clockwise for that speed. A voltage increase of 0.05 VDC will increase the motor torque by one oz-ft.

A one oz-ft adjustment in motor torque will approximately increase/decrease the fan output by 25–50 cfm.

Record the new values set for each Flo setting under Field Set values.

Table I1: ECM Motor Adjustment Values

Factory Set		Field Set	
Test Point	Measured Value	Test Point	Measured Value
Flo 0		Flo 0	
Flo 1		Flo 1	
Flo 2		Flo 2	
Flo 3		Flo 3	
Flo 4		Flo 4	



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